

# Chapter 7 MICROMETERS

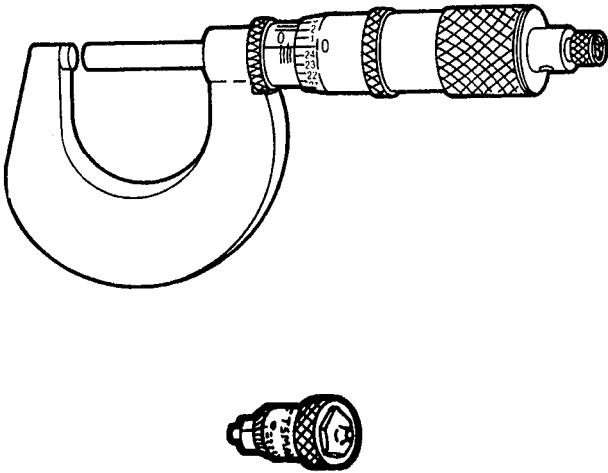
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## HOW TO CHOOSE AND USE THEM

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The "Types and Uses" section provides you with a list of the types of micrometers. These pages should help you select the right micrometer for the job.

The "Reading Micrometers" section tells you how to read the different varieties of micrometers. By becoming familiar with the procedures you will learn to make accurate measurements.



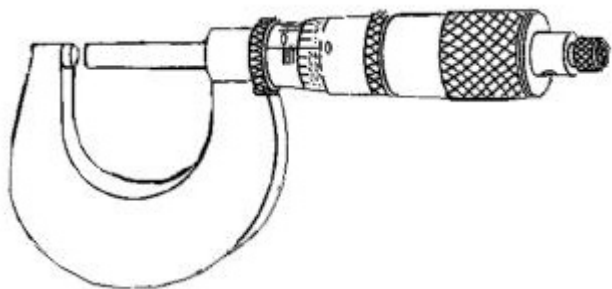
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## TYPES AND USES

Micrometers are instruments used to measure distances to the nearest one-thousandth of an inch. The measurement is usually expressed or written as a decimal. There are three types of micrometers which are commonly used: the outside micrometer, the inside micrometer, and the depth micrometer.

### OUTSIDE MICROMETERS



Outside micrometers are used to measure an outside distance or diameter to an accuracy of .001 of an inch.

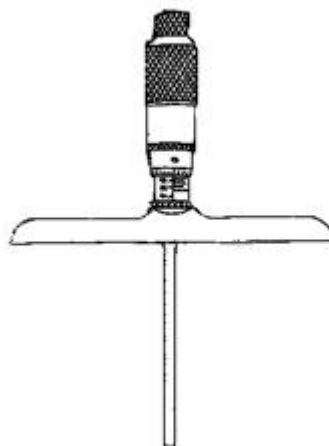
### INSIDE MICROMETERS



Inside micrometers are used to measure an inside diameter to an accuracy of .001 of an inch.

ID micrometers have a range of .500 when used with one-half inch spacers. (For remaining one-half inch, see page 7-3.)

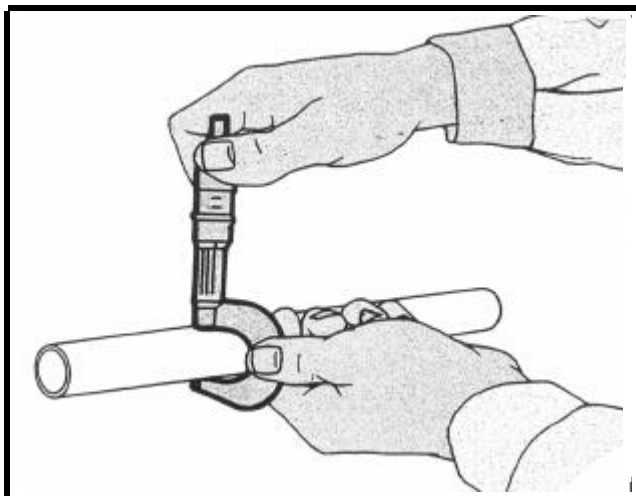
### DEPTH MICROMETERS



Depth micrometers are used to measure depths to an accuracy of .001 inches.

## SELECTING THE PROPER MICROMETER

The types of micrometers commonly used are made so that the longest movement possible between the spindle and the anvil is 1 inch. This movement is called the "range." The frames of micrometers, however, are available in a wide variety of sizes, from 1 inch up to as large as 24 inches. The range of a 1 inch micrometer is from 0 to 1 inch. In other words, it can be used to work where the part to be measured is 1 inch or less. A 2-inch micrometer has a range from 1 inch to 2 inches, and will measure only work between 1 and 2 inches thick. A 6-inch micrometer has a range from 5 to 6 inches, and will measure only work between 5 and 6 inches thick. It

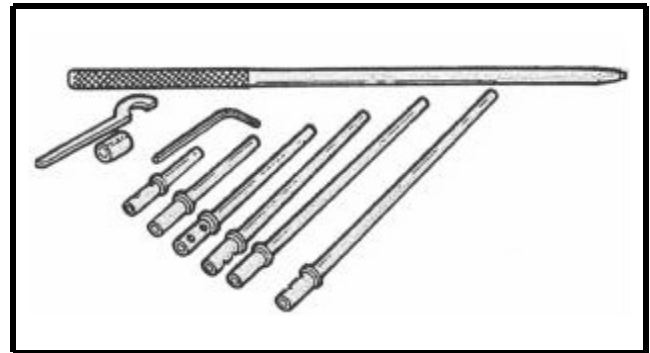
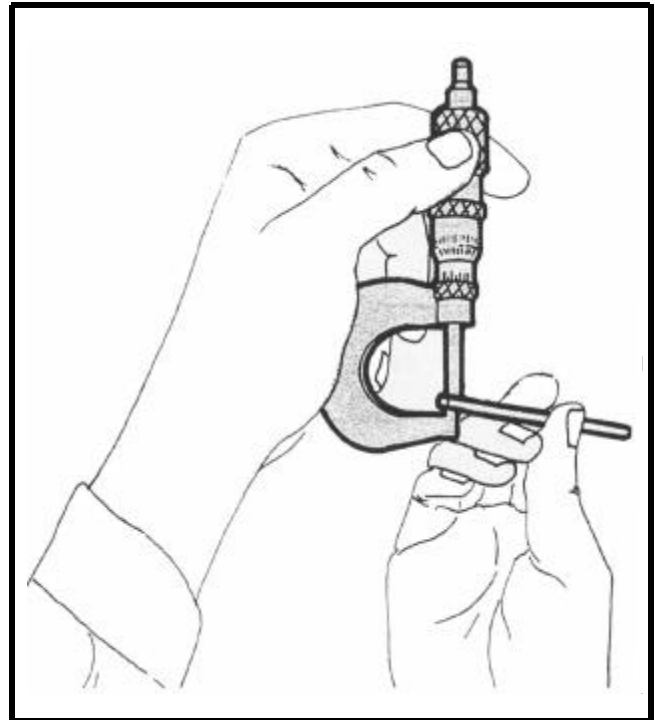
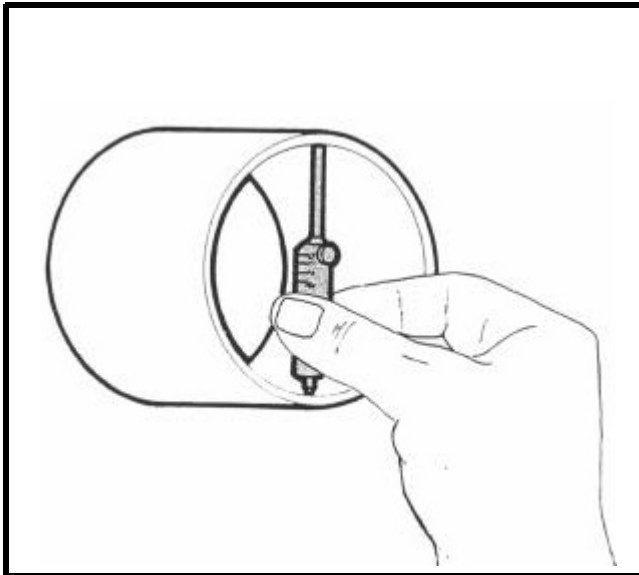


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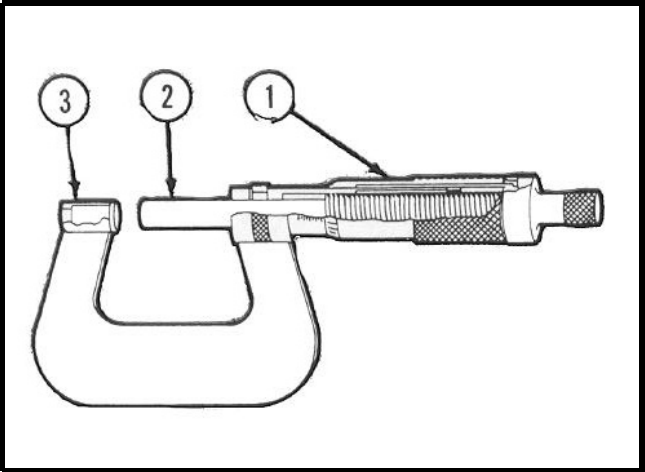
## SELECTING THE PROPER MICROMETER - Continued

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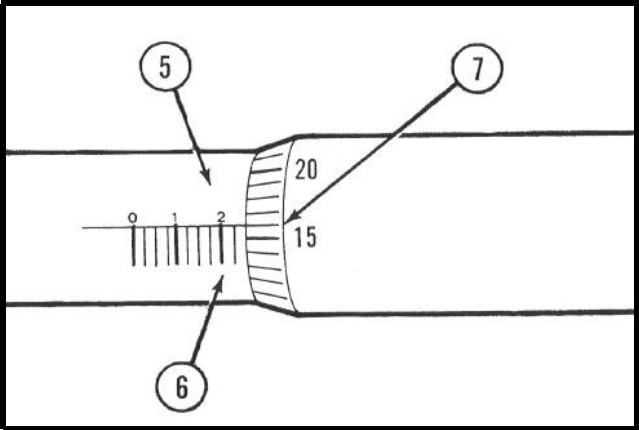
is necessary, therefore, that the mechanic first find the approximate size of the work to the nearest inch, and then select a micrometer that will fit it. For example, to find the exact diameter of a piece of round stock use a rule and find the approximate diameter of the stock. If it is found to be approximately 3-1/4 inches, a micrometer with a 3- to 4-inch range would be required to measure the exact diameter. Similarly, with inside and depth micrometers, rods of suitable lengths must be fitted into the tool to get the approximate dimension within an inch, after which the exact measurement is read by turning the thimble. The size of a micrometer indicates the size of the largest work it will measure.



READING A STANDARD MICROMETER

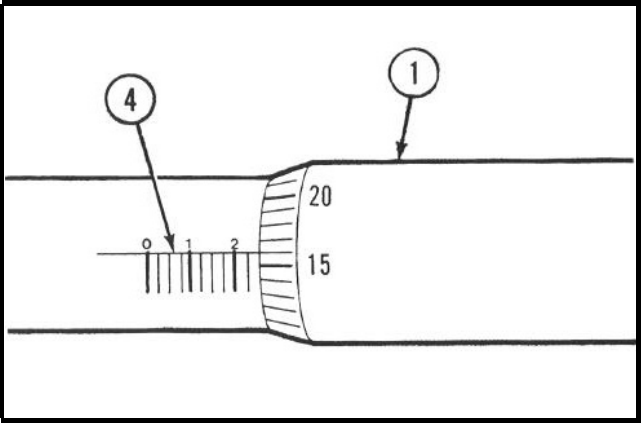


Reading a micrometer is only a matter of reading the micrometer scale or counting the revolutions of the thimble and adding to this any fraction of a revolution. The micrometer screw has 40 threads per inch. This means that one complete and exact revolution of the micrometer screw (1) moves the spindle (2) away from or toward the anvil (3) exactly 1/40 or 0.025 inch.



TO READ A MEASUREMENT AS SHOWN ABOVE.

Read highest figure  
visible on barrel (5) . . . . . 2 = 0.200 in.  
Number of lines visible  
between the No. 2 and  
thimble edge (6) . . . . . 1 = 0.025 in.  
The line on the thimble that  
coincides with or has passed  
the revolution or long line  
in the barrel (7) . . . . . 16 = 0.016 in.  
TOTAL = 0.241 in.

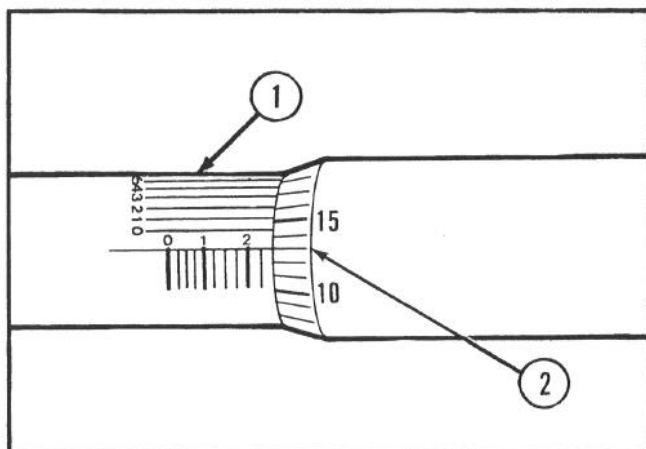


The lines on the barrel (4) conform to the pitch of the micrometer screw (1), each line indicating 0.025 inch, and each fourth line being numbered 1, 2, 3, and so forth.

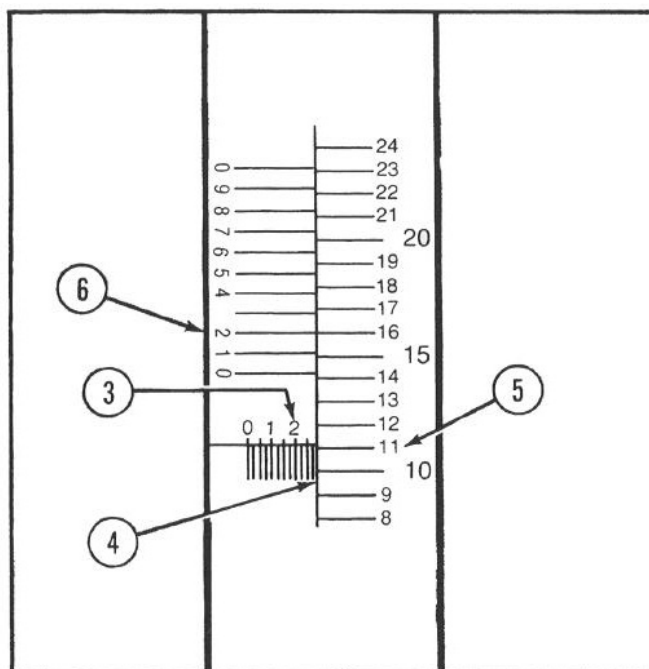
The beveled edge of the thimble is graduated into 25 parts, each line indicating 0.001 inch, or 0.025 inch covered by one complete and exact revolution of the thimble. Every fifth line on the thimble is numbered to read a measurement in thousandths of an inch.

## READING A VERNIER MICROMETER

Reading the vernier micrometer is the same as reading the standard micrometer. An additional step must be taken, to add the vernier reading to the dimensions. This allows for precise measurements which are accurate to ten-thousandths (0.0001) of an inch. This scale furnishes the fine readings between the lines on the thimble rather than making an estimate as you would on a standard micrometer.



The ten spaces on the vernier (1) are equivalent to 9 spaces on the thimble (2). Therefore, each unit on the vernier scale is equal to 0.0009 inch and the difference between the sizes of the units on each scale is 0.0001 inch.



TO READ A MEASUREMENT AS SHOWN ABOVE:

Read highest figure  
visible on barrel (3). . . . . 2 = 0.200 in.

Number of lines visible  
between the No. 2 and  
thimble edge (4). . . . . 3 = 0.075 in.

The line on the thimble  
that coincides with or  
is nearest the  
revolution or long line  
in the barrel (5) . . . . . 11 = 0.011 in.

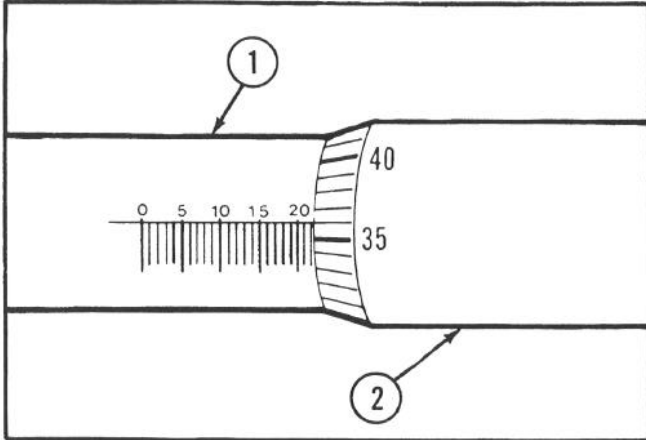
The line on the vernier  
scale that coincides  
with the line on the  
thimble (6) . . . . . 2 = 0.0002 in.

TOTAL .2862 in.

## READING A METRIC MICROMETER

The same principle is applied in reading the metric graduated micrometer, but the following changes in graduations are used:

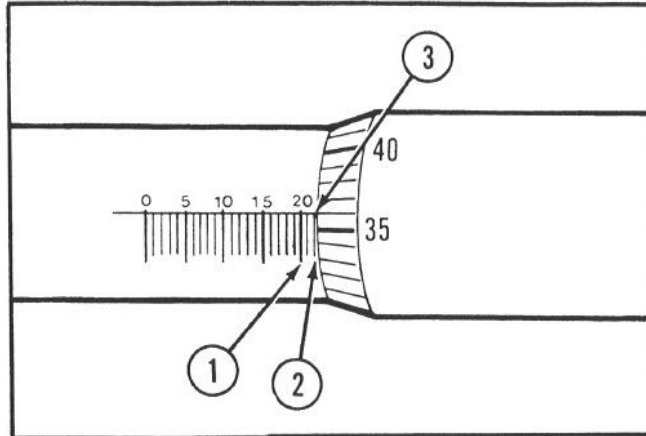
The pitch of the micrometer screw is 0.05 mm. One revolution of the spindle advances or withdraws the screw a distance equal to 0.5 mm.



The barrel (1) is graduated in millimeters from 0 to 25. It takes two revolutions of the spindle to move the barrel 1 mm.

The thimble (2) is graduated in 50 divisions with every fifth line being numbered.

Rotating the thimble from one graduation to the next moves the spindle  $\frac{1}{50}$  of 0.5 mm, or  $\frac{1}{100}$  mm. Two graduations equal  $\frac{2}{100}$  mm, and so forth.



TO READ MEASUREMENT AS SHOWN ABOVE:

Read highest figure  
visible on barrel (1) . . . . . 20 = 20.0 mm

Number of lines visible  
between the No. 20 and  
thimble edge (2) . . . . . 2 = 2.0 mm

The line on the thimble  
that coincides with or  
has passed the  
revolution or long line  
in the barrel (3) . . . . . 36 =  $\frac{36}{100}$  (.36) mm

### NOTE

Remember that 1 revolution is 0.5 mm. It takes 2 revolutions to move 1 mm.

Measurement reading . . . . . TOTAL 22.36 mm

## CARE OF MICROMETERS

1. Coat metal parts of all micrometers with a light coat of oil to prevent rust.
2. Store micrometers in separate containers provided by manufacturer.
3. Keep graduations and markings on all micrometers clean and legible.
4. Do not drop any micrometer. Small nicks or scratches can cause inaccurate measurements.